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Added effect of fascia taping technique on pain and foot function in patients with plantar fasciitis

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ABSTRACT

The purpose of this study is to investigate the added effect of fascia taping technique on pain and foot function in patients with plantar fasciitis using VAS and FFI scores respectively. Plantar fasciitis has become one of the common chronic overuse injury of the plantar fascia of foot, most commonly at its insertion affecting 10% of the population amongst the total non-traumatic foot injury. 26 (men and women) subjects with plantar fasciitis were recruited for the study and equally divided into two groups. The patients in the control group were given traditional physiotherapy (plantar flexor stretching, plantar fascia stretching and ice pack for 10-15 mins) on first day and patients in the experimental group were given fascia taping technique in addition to the traditional physiotherapy. Tape was applied on the plantar fascia for continuously 3 days. Pre and post assessment was carried out on first day and third day of treatment. VAS and FFI are the outcome measures used the study to assess pain and foot function. Wilcoxon matched-pairs signed-ranks Test was used to analyse the pre and post values of VAS and FFI in control and experimental group with results as extremely significant with p-values as 0.0005 and 0.0002 respectively for FFI scores. VAS scores shows very significant (0.002) results in control group and extremely significant (0.0005) in experimental group. Mann-Whitney U Test was used to analyze the difference of mean of control and experimental group i.e. extremely significant (0.0002) for FFI and significant (0.016) for VAS. Fascia taping technique is effective in treating pain and improving foot function in patients with plantar fasciitis.

Keywords: VAS (Visual Analogue Scale), FFI (Foot Function Index), Plantar fasciitis.

INTRODUCTION

Plantar fasciitis is a common chronic overuse injury of the plantar fascia of foot, most commonly at its insertion. [1]

The plantar fascia is a thickened fibrous aponeurosis that originates from the medial

tubercle of the calcaneus, runs forward to insert into the deep, short transverse ligaments of the metatarsal heads, dividing into 5 digital bands at the metatarsophalangeal joints and continuing forward to form the fibrous flexor sheathes on the plantar aspect of the toes. It is made up of 3 distinct

parts: the medial, central, and lateral bands. The central plantar fascia is the thickest and strongest section, and this segment is also the most likely to be involved with plantar fasciitis. It functions as a tension bridge in the foot, providing both static support and dynamic shock absorption through windlass mechanism [2]. Windlass mechanism occurs during terminal stance during heel off. During terminal stance, as the gastrocnemius and soleus contracts actively to lift heel off the ground, extension occurs at the metatarsophalangeal joint. The plantar fascial bands envelops the convex surface of the metatarsal heads producing windlass effect. This accumulation of tension in the plantar fascia raises the longitudinal arc and tends to resist the longitudinal arc and tends to resist the posterior and superior rotation of the calcaneus [3].

The process of fasciitis involves repetitive strain that seems to cause microtearing, which includes a repair response which leads to thickening and fibrosis of plantarfascia along with collagen necrosis, chondroid metaplasia and calcification i.e degenerative mechanism[4] and may have osteophyte formation in the insertion site of the calcaneal bone.[1]

Patients classically comes with medial plantar heel pain on weight bearing, which is often most intense during first few steps in the morning but tends to improve with rest. [4] Acute exacerbation may occur at any time when rising from seated position .Physical examination include reproducible pain with palpation of the plantar medial aspect of the heel and pain with passive dorsiflexion of the ankle and toes. ^[4]However, the pain may recur later on if the stepping force is increased or the continuous weight bearing period is prolonged. [1] Risk factors include high intensity or duration of activity like in adults, faulty footwear, obesity, pes planus/cavus, leg length discrepancy, excessive lateral tibial torsion, and excessive femoral anteversion, tightness in the hamstrings, gastrocnemius soleus, and the achilis tendon, weakness of the gastrocnemius, soleus, and intrinsic foot muscles [2].

Therapeutic interventions include systemic medication, ultrasound, deep friction massage, plantar fascia stretch, strengthening of toe flexors, foot arch support, heel cushion, traditional nonelastic taping, night splinting, and local steroid injection [2, 5].

Kinesiotaping was originally developed in Japan by Kase [1]. Kinesiotape is a thin porous cotton fabric with a medical grade acrylic adhesive. The tape can be stretched up to 140 percent of the original length. After taping, the mobility of the applied muscle, joint or fascia can still be maintained at full range. [1]A K-Taping application facilitates the reduction of edema and inflammation, improves lymph and blood circulation, and contributes, through proprioception, to the normalization of muscle function and the support of ligaments and tendons. The result is generally a rapid reduction of pain and an improvement in the joint and muscle function. It can be applied theoretically to any muscle or joint of the body, and it can be worn up to four days without interfering with the daily hygiene and without modifying its adhesive properties [6]. KT purportedly mimics the physical qualities of the skin as it is believed to be the same weight and thickness of the epidermis along with its inherent elastic properties. The glue is heat activated. It is both waterproof and breathable and it can be worn during exercises, showering and even swimming [7].When skin in the affected area is stretched prior to the application of K-Tape, the skin, together with the tape, forms wave-like convolutions on returning to the resting state. Through this lifting of the skin, the space between skin and subcutaneous tissue increases which helps to drain the lymph and inflammatory substance more easily, helping to reduce pressure on pain receptors.At the same time, the tissue is constantly lifted and lowered through bodily movement. Lymphatic drainage and blood circulation are stimulated in a similar way to a pump action. In addition, movement ensures continual displacement of the skin [6]. This study aims to see the added effect of fascia taping technique on pain and foot function in patients with plantarfasciitis. Evidences shows icepack, plantarfascia stretching, tendoachilis stretching, ultrasound, intrinsic foot muscle strengthening are conventionally used treatment for plantarfasciitis. Studies have proved effectiveness of gastrocnemius muscle technique of kinesiotaping for reducing pain in plantarfasciitis. There is derth in the literature regarding effects of fascia technique of kinesio taping for improving pain and foot function in plantar fasciitis.

MATERIALS AND METHODOLOGY

Type of study was Experimental pre-post study with Simple random sampling method. The study was carried out at Bhausaheb Sardesai Talegaon Rural Hospital. 26 men and women were selected for the study with diagnosed plantar fasciitis in the age group of 20-50 with pain lasting more than 6 months [8]. Patients with Ankle or foot surgery, heel spur, ankle sprain, patients with skin conditions, congenital deformity, recent unhealed wound, lower limb spasticity, ankle or foot fracture, ankylosing spondylosis were excluded from the study. Informed consents were taken from all the subjects and no additional treatment was given during the study period. Subjects were equally divided into two groups: control group (13 patients) and experimental group (13 patients). Patients were treated on the first day and asked to come for follow up after 72 hours. On first day VAS and foot function index scores of all the patients were taken, calculated [9] and reported.

Control group was given Ice pack for 10-15 min, plantarflexor stretching: To stretch gastrocnemius muscle Patient in supine with knee extended and for soleus muscle patient in supine position with knee flexed to eliminate the effect of the two-joint gastrocnemius muscle. Grasp patient's heel with one hand, maintain the subtalar joint in neutral and place forearm along the plantar surface of the foot. Stabilize tibia with other hand and dorsiflex the talocrural joint of the ankle by pulling the calcaneus in an inferior direction with thumb and fingers while gently applying pressure in a superior direction just proximal to the heads of the metatarsals with forearm and Plantar fascia stretching: It is given in supine position. Therapist's one hand stabilizes calcaneus and stretching to the plantar fascia was given by extending the toes at metatarsophalangeal joint. Experimental Group received whole conventional treatment (as explained above) along with fascia kinesiotope technique.



Procedure for taping

The original site for taping was marked on the posterior margin of the calcaneal bone. The four end sites of taping were marked on the metatarsal joints of the first to fifth toes, except the third. During the taping, the patient was in a prone position with the knee joints at 90° of flexion and the ankle joints at a neutral position. The procedure of “palm- shape” taping was applied to the plantar fascia. The tape was cut longitudinally into four slices of equal width extended up to about two-

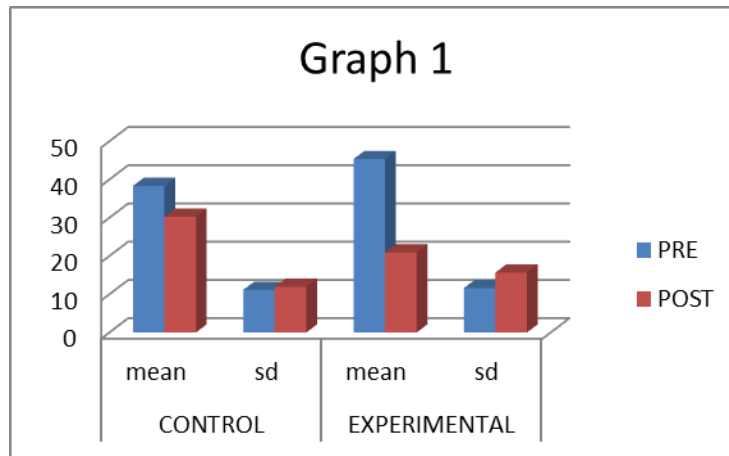
thirds of the whole length of the tape to be used. The common end of the tape was firmly adhered to the marked original site over the calcaneal bone and then stretched distally to stick the four ends of the sliced tape on the marked sites of fore- foot. The tape was stretched so that the length was increased to about 133 percent of the original length in order to provide a negative tension to the plantar fascia. [1]

RESULTS

In this study total of 26 (both males and females) subjects were taken which was divided into two groups, control and experimental. There was no difference in location of pain in subjects of both the groups. FFI and VAS are the outcome measures which were used in the study and statistical analysis in the group between pre and post scores was taken by Wilcoxon matched-pairs signed-ranks Test and comparison between the groups were taken by Mann-Whitney U Test.

Graph 1

Shows **FFI** score, comparing mean and SD of pre and post treatment of control and experimental group. Mean and SD of control group pretreatment is 38.328 ± 11.15 which is 30.268 ± 11.97 post treatment. Mean and SD of experimental group pretreatment is 45.345 ± 11.621 which is 20.946 ± 15.675 .

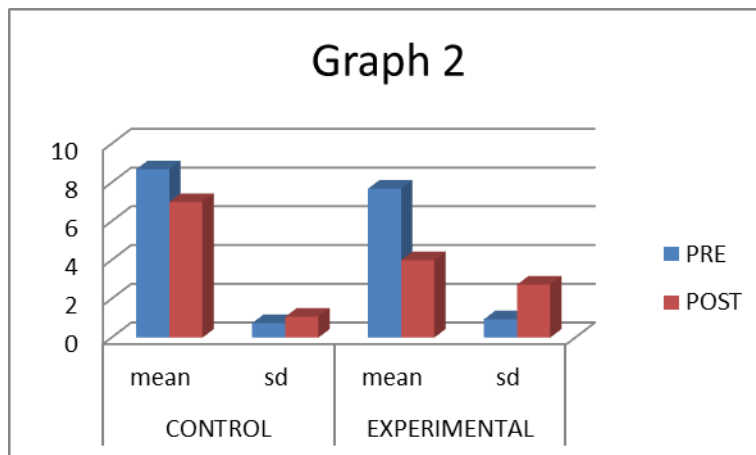


Graph 2

Shows **VAS** score, comparing mean and SD of pre and post treatment of control and experimental group. Mean and SD of control group pretreatment is 8.692 ± 0.75 which is 7 ± 1.08 post treatment. Mean and SD of experimental group pretreatment is 7.692 ± 0.947 which is 4 ± 2.73 post treatment.

There is a decrease in mean FFI pre and post score of control and experimental group with

respective p-values as 0.0005 and 0.0002 showing very significant and extremely significant results post treatment using Wilcoxon matched-pairs signed-ranks Test. Mean difference of pre and post scores of experimental group is greater than that of the control group with p-value 0.0002, showing extremely significant results post treatment in experimental group, using Mann-Whitney U Test.



There is a decrease in mean difference of pre-post VAS score in both control and experimental group with p-values as 0.002 and 0.0005 respectively showing very significant and extremely significant results post treatment in both the groups using Wilcoxon matched-pairs signed-ranks Test. Mean difference of pre and post scores of experimental group is greater than that of the control group with p-value 0.016 showing significant results in experimental group, using Mann-Whitney U Test.

DISCUSSION

In the present study we demonstrated that foot functions [FFI] were improved significantly [p=0.0002] and pain [VAS] at insertion site also reduced significantly [p=0.016] in the experimental group compared to the control group after fascia correction kinesiotaping technique. Also a study done by Chien-Tsung Tsai, Wen-Dien Chang, Jen-Pei Lee concluded that kinesiotape helped in reducing pain in plantar fasciitis better than a traditional treatment programme only^[1]. Whereas Akshay V. Khatavkar, compared kinesiotaping technique with intrinsic muscle strengthening and cryotherapy demonstrated improvement in pain and plantar fascia thickness [10].

The possible mechanism of kinesiotaping to treat plantar fasciitis, reduce pain and improve foot function may be: The technique of kinesiotaping, including selection of taping site, pulling direction, and pulling force, is critical in treating soft tissue lesions. It should follow the principle of motion analysis and biomechanics. In general, the original site is usually selected at the origin of the desired pulling force and the insertion site is determined by the desired strength of the pulling force. The direction of the force is usually parallel to the direction of muscle fibers. It may also allow the tape to cover the skin area to be stimulated [tactile stimulation]. The strength of the force depends on the desired intensity of tactile stimulation and the desired limitation of the range of stretch to the muscle fibers, tendons, or ligaments, or the range of motion for the joint [10].

Fascia has contractile components, which can integrate proprioceptive signals and assist in load bearing. Fascia has been described as having plastic properties, because it deforms when a load is imposed and complete recovery of its normal state

may take several hours. Repetitive movement of a specific muscle group can produce a thickening or shortening of the superficial and/or deep fascia surrounding the activated muscle, which may provide more stability and allow the muscle to generate more power. During the process of fascia remodeling, inadequate lengthening (regular stretching) may produce a dysfunctional state that could increase risk for fascia tearing. The repair process is initiated when a fascia injury occurs. Proliferation and activation of fibroblasts results in the deposition of collagen at the location of the injury. When KT is applied in a manner that creates convolutions in the skin, which are believed to increase the interstitial spaces between sheets of fascia, thereby reducing stiffness, improving joint range of motion, and decreasing pain. When applying kinesiotape, the body segment is placed in a stretched position, so that return to a normal resting position will create skin convolutions. By lifting the skin, subcutaneous blood flow and lymphatic drainage are believed to be increased, which helps to facilitate muscle relaxation [11] and it is believed to unload the underlying fascia, thereby reducing pain. KT has been theorized to affect the deep fascia layers, which might decrease susceptibility to microtearing of the tissue [12]. A study done by Thiago Vilela lemos et al (2014) on The Effect of Kinesio Taping in Forward Bending of the Lumbar Spine concluded that a fascia correction technique promotes changes in fascia mobility and also allows to gain flexibility [13]. Kinesio Tape also serves to assist in the realignment of the fascia and muscle fibers [11]. After kinesiotaping, the thickness at the insertion site also reduces. It appears that kinesiotaping can effectively reduce the inflammatory reaction in a certain region [the insertion site] of the plantar fascia [10] [1].

The fascia is innervated by free nerve endings that convey nociceptive neural signals. In fact, nociceptors are most abundant in the skin and the outer layers of connective tissue. A pain signal is transmitted from the fascia to the spinal cord, and ultimately to the brain, but the exact pathway for transmission of the pain impulse can vary [12]. Reduction in pain may be because of the reduced pulling force to the plantar fascia [negative tension from taping] and the improvement in focal circulation might also be an important factor for pain relief. It is unclear whether the direct

mechanical stimulation [from the shearing force of taping] to the nociceptors and/or mechanoreceptors plays any role in pain relief [1].

CONCLUSION

Based on the statistical analysis, interpretation and the obtained results in the present study it is strongly recommended that fascia correction kinesiotaping technique helped in reducing pain at insertion site of plantar fascia and improving foot

function in subjects treated with kinesiotaping in addition to the conventional therapy.

List of abbreviations

VAS-Visual Analogue Scale, FFI-Foot Function Index, SD- Standard Deviation

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